

ENGINEERING CHANGE PROPOSAL (SHORT FORM) (See MIL-STD-481 for instructions)				DATE (YYYYMMDD) 20040823		Form Approved OMB No. 0704-0188			
				PROCURING ACTIVITY NUMBER N/A					
1. ORIGINATOR NAME AND ADDRESS Kase J. Saylor Southwest Research Institute 6220 Culebra Rd. Bldg. 189 San Antonio, TX 78238				2. CONTRACT NUMBER AND LINE ITEM 3. PROCURING CONTRACTING OFFICER CODE _____ TEL _____					
4. TITLE OF CHANGE Clarification of the MCC Words description.									
5. ECP NUMBER MCC 2004014		REV _____	AMEND _____	6. CAGE CODE		7. CLASS OF ECP		8. JUST CODE	9. PRIORITY
10. SPECIFICATIONS AFFECTED				11. DRAWINGS AFFECTED					
CAGE CODE	SPECIFICATION / DOCUMENT NO.	REV	CAGE CODE	NUMBER	REV				
	PMT 90-S002	I							
12. CONFIGURATION ITEM NOMENCLATURE / TYPE DESIGNATION / WEAPON SYSTEM CODE N/A							13. IN PRODUCTION <input type="checkbox"/> YES <input type="checkbox"/> NO		
14. LOWEST ASSEMBLY AFFECTED									
NOMENCLATURE				PART NO.		NSN			
N/A									
15. DESCRIPTION OF CHANGE (Attach a document showing [a] existing document paragraph, figure, or table and [b] modified document paragraph, figure, or table with the change incorporated). Both the wording and the figures used in section 3.2.1.1-3 to describe the MCC Word has been changed.									
16. NEED FOR CHANGE The wording used in the current version is somewhat confusing, so these changes have been implemented to alleviate this confusion.									
17. EFFECT ON ASSOCIATED EQUIPMENT									
18. PRODUCTION EFFECTIVITY BY SERIAL NUMBER				19. EFFECT ON PRODUCTION DELIVERY SCHEDULE					
20. RECOMMENDED RETROFIT EFFECTIVITY			21. ESTIMATED KIT DELIVERY SCHEDULE			22. ESTIMATED COST/SAVINGS			
23. SUBMITTING ACTIVITY AUTHORIZING SIGNATURE Kase Saylor Signed 11/8/2004				23.a. TITLE Engineer, SWRI					
24. APPROVAL/DISAPPROVAL a. RECOMMENDED <input checked="" type="checkbox"/> APPROVAL <input type="checkbox"/> DISAPPROVAL									
b. APPROVAL <input checked="" type="checkbox"/> APPROVED <input type="checkbox"/> DISAPPROVED		3. GOVERNMENT ACTIVITY PEOSTRI 12350 Research Parkway Orlando, FL 32826-3276			SIGNATURE Perry R. Smith, LTC AD PMLTS		DATE (YYYYMMDD) 20041108		
d. APPROVAL <input type="checkbox"/> APPROVED <input type="checkbox"/> DISAPPROVED		e. GOVERNMENT ACTIVITY			SIGNATURE		DATE (YYYYMMDD)		

15a. Existing document paragraph, figure, or table.**3.2.1. MCC Word Format.**

The Word has a structure format that is detailed in the following paragraphs:

Word Time Base.

The Word time base clock rate is 48KHz $\pm 0.015\%$. The word time base is partitioned into 11 Time Slots labeled 0, 1, 2, ... 10. The Time Slot duration is 333.3 μs $\pm 0.015\%$ based on the on the 3KHz sub-harmonic of the 48KHz time base clock. Each Time Slot is further subdivided into 16 time intervals; each referred to as a Bin. The Bins are numbered by convention 0, 1, ... 15. Each Bin has time duration of 20.83 μs $\pm 0.015\%$ based on the fundamental 48KHz-clock frequency. The Word has a total duration of 3.667 ms $\pm 0.015\%$. Refer to Figure 1(below).

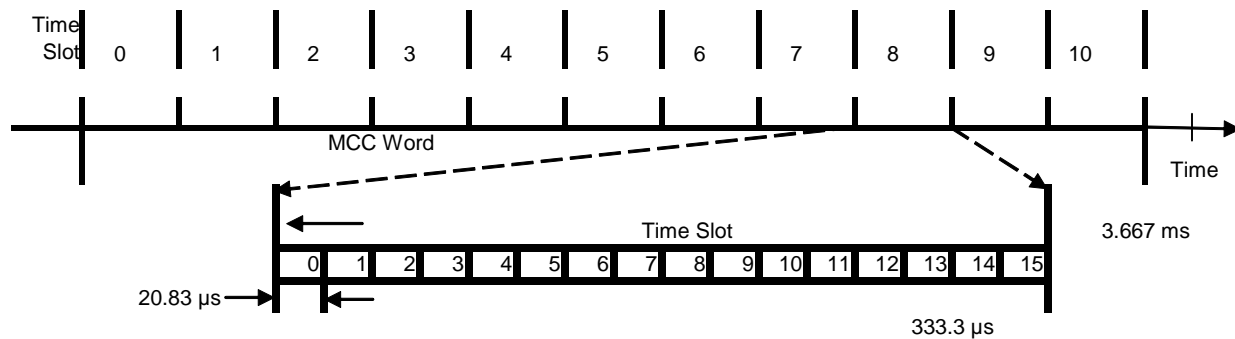


Figure 1: MCC Word Time Base Format

3.2.1.2. Word Digital Bit Format.

The Word is structured using a digital bit format. The bits are precisely positioned on the Word time base. Logic State 1 represents a communication medium activation: for example a laser light pulse. Logic State 0 represents the absence of a communication medium activation. Each Logic State 1 is precisely positioned in a specific Bin in a specific Time Slot.

3.2.1.2.1. Word Bit Weight.

Every MCC Word contains exactly 10 Logic State 1 for a total Word Bit Weight of 10 except the basic MILES Code subset without Player ID. The basic MILES code word is composed of 11 bits with a weight of 6 bits always being Logic State 1 and the remaining 5 bits being Logic State 0. Refer to Appendix A and F.

3.2.1.2.2. Bit Positioning.

Logic State 1 is positioned only in Bin 0, 6, 8, or 10 of a Time Slot and:

- A Word will NEVER have a valid Logic State 1 positioned in Bin 1, 2, 3, 4, 5, 7, 9, 11, 12, 13, 14 or 15.
- There will NEVER be more than two Logic State 1 in any Time Slot.
- A valid Word will ALWAYS have a Logic State 1 in the Bin 0 of its first two Time Slots (Time Slot 0 and Time Slot 1) and a Logic State 0 in Bin 0 of the third Time Slot (Time Slot 2), except for code E1 (special codes) which has a Logic State 1 in Bin 0 of the third Time Slot (Time Slot 2).

3.2.1.3. MCC Word Code Designator.

The MCC Word Code Designator uniquely specifies the exact MCC Word bit pattern positioned in its time base. It has the format X.YZ.SPID where:

- X** is a decimal number from 00 to 36, each of which identifies a specific Basic MILES Code bit pattern as listed in Appendix A. Each Logic State 1 in Appendix A is always positioned in a Bin 0 of any Time Slot of a MCC Word in which it occurs.
- SPID** (Standard Player Identification) is a decimal number from 001 to 330 each of which identifies a specific bit pattern as listed in Appendix B. These bit patterns are used to encode desired Player Identification (PID), Ammunition Type and Friend or Foe designation into the MCC Word. Refer to Paragraph 3.2.1.5.1 for the method to translate any desired Player ID number, ranging from 0001 to 3300, for any specified allowed ammo type into the MCC YZ.SPID portion of the Word Designator.
- Y** is a hexadecimal number, 0 to F, each representing a binary number, 0000 to 1111, in the order most

significant digit to least significant digit. A 0 signifies that the Logic State 1 in the SPID bit pattern in that position is located in a Bin 8 of a Time Slot. A 1 signifies that the Logic State 1 in the SPID bit pattern is located in a Bin 6 of a Time Slot. The most significant Y digit applies to the first Logic State 1 of a SPID bit pattern reading from left column to right column (D0 to D10) in Appendix B. The second digit applies to the second Logic State 1, etc.

- d. **Z** is a hexadecimal number, 0 to F, each representing a binary number, 0000 to 1111, in the order most significant digit to least significant digit. A 1 signifies that the binary bit in the SPID bit pattern is positioned in a Bin 10 of a Time Slot superceding the position specified by the Y instruction. A 0 signifies that the bit in the SPID bit pattern remains in the position specified by the Y instruction. The most significant Z digit applies to the first Logic State 1 of a SPID bit pattern reading from left column to right column (D0 to D10) in Appendix B. The second digit applies to the second Logic State 1, etc.

A complete list of the valid MCC PID/Ammo type partition is contained in Appendix C, Table 1, for each X entry in Appendix A. Appendix C, Table 2 specifies Bin positions corresponding to the YZ portion of the Word Designator.

3.2.1.3.1. Example MCC Word Designator Translation to Its Bit Pattern

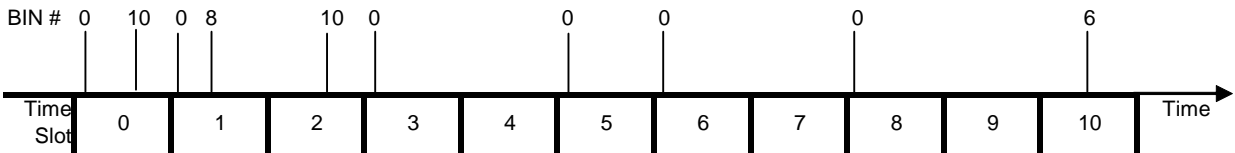


Figure 2: MCC Word 12.1.A.211 Bit Pattern

For example, the bit pattern for Word, 12.1A.211, illustrated in Figure 2, translates as follows:

- a. The first two digits, 12, is **X**, the Basic Miles Code bit pattern. Look this up in Appendix A under the entry X = 12. Each Logic State 1 is positioned in Bin 0 of the Time Slot corresponding to its column position in Appendix A. A Logic State 1 in column D0 is positioned in Bin 0 of Word Time Slot 0, etc.
- b. The last three digits, 211, are **SPID**, the bit pattern found in Appendix B under entry 211. Each of the Logic State 1 is positioned in the Time Slot (labeled 0, 1, ... 10) corresponding to the column that the bit occurs (labeled D0, D1, ... D10). Each bit is precisely positioned in either Bin 6, Bin 8, or Bin 10 of its Time Slot according to the instruction contained in the Y and Z hexadecimal code digits of the Word Designator. In this example, the bit pattern specified by 211 has a Logic State 1 in Time Slots 0 (D0), 1(D1), 2(D2), and 10 (D10).
- c. The **Y** hexadecimal digit, 1, converted to binary in the order most significant bit to least is 0001. A 1 signifies that its corresponding Logic State 1 is positioned in Bin 6 of a Time Slot. A 0 signifies that the corresponding bit is positioned in a Bin 8 of its corresponding Time Slot. In this example, the bit in Time Slot 0 is positioned in Bin 8, the bit in Time Slot 1 is in Bin 8, the bit in Time Slot 2 is in Bin 8, and the bit in Time Slot 10 is in Bin 6.
- d. The **Z** hexadecimal digit, A, converted to binary is 1010. A 1 signifies that the corresponding bit is positioned in a Bin 10 of its Time Slot superceding the instruction of the Y hexadecimal digit. A 0 signifies that the corresponding bit remains in the Bin in which it was positioned by the Y hexadecimal digit code instruction. In this example, the bit in Time Slot 0 shifts to Bin 10 and the bit in Time Slot 1 remains in Bin 8, the bit in Time Slot 2 shifts to Bin 10, and bit Time Slot 10 remains in Bin 6. The result is the bit pattern for Word, 12.1A.211, properly structured on its time base shown in Figure 2.

Refer to Appendix C, Table 2 for a list of all valid YZ.SPID Designator SPID bit pattern Bin locations.

15b. Modified document paragraph, figure, or table with the change incorporated.

3.2.1. MCC Word Format.

The Word structure is detailed in the following paragraphs:

3.2.1.1. Word Time Base.

The Word time base clock rate is 48KHz $\pm 0.015\%$. The word time base is partitioned into 11 Time Slots labeled 0, 1, 2, ... 10. The Time Slot duration is 333.3 μs $\pm 0.015\%$ based on the 3KHz sub-harmonic of the 48KHz time base clock. Each Time Slot is further subdivided into 16 time intervals; each referred to as a Bin. The Bins are numbered by convention 0, 1, ... 15. Each Bin has time duration of 20.83 μs $\pm 0.015\%$ based on the fundamental 48KHz-clock frequency. The Word has a total duration of 3.667 ms $\pm 0.015\%$. Refer to Figure 1(below).

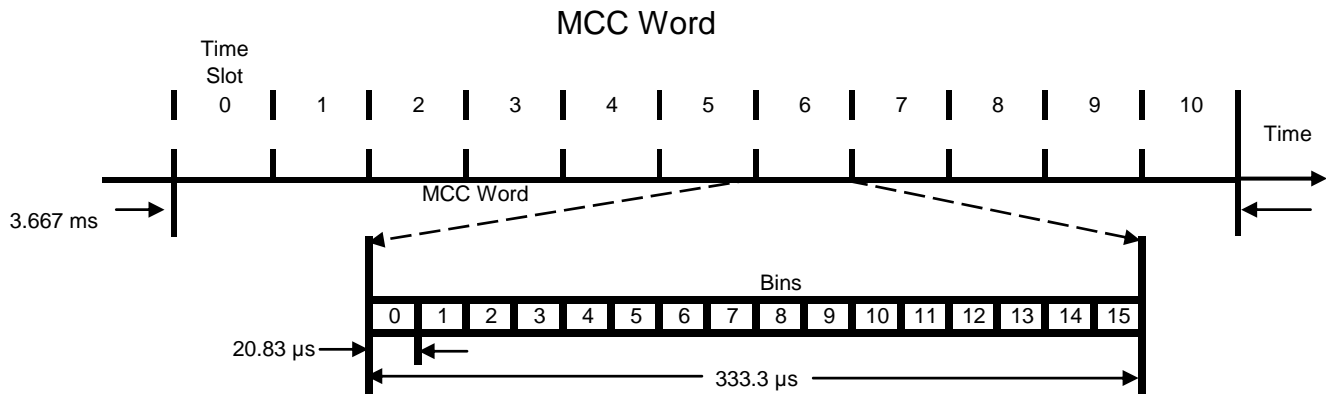


Figure 1 MCC Word Time Base Format

3.2.1.2. Word Digital Bit Format.

The Word is structured using a digital bit format. The bits are precisely positioned on the Word time base. A Logic State 1 represents a communication medium activation: for example a laser light pulse. A Logic State 0 represents the absence of a communication medium activation. Each Logic State 1 is precisely positioned in a specific Bin in a specific Time Slot.

3.2.1.2.1. Word Bit Weight.

Every MCC Word contains exactly 10 Logic State 1s for a total Word Bit Weight of 10, except the basic MILES Code subset without Player ID. The basic MILES code word is composed of 11 bits with a weight of 6 bits always being Logic State 1 and the remaining 5 bits being Logic State 0. Refer to Appendix A and F.

3.2.1.2.2. Bit Positioning.

Logic State 1 is positioned only in Bin 0, 6, 8, or 10 of a Time Slot and:

- A Word will NEVER have a valid Logic State 1 positioned in Bin 1, 2, 3, 4, 5, 7, 9, 11, 12, 13, 14 or 15.
- There will NEVER be more than two Logic State 1s in any Time Slot.
- A valid Word will ALWAYS have a Logic State 1 in the Bin 0 of its first two Time Slots (Time Slot 0 and Time Slot 1).
- A Word will generally have a Logic State 0 in Bin 0 of the third Time Slot (Time Slot 2), except for code E1 (special codes) that has a Logic State 1 in Bin 0 of the third Time Slot (Time Slot 2).

3.2.1.3. MCC Word Code Designator.

The MCC Word Code Designator uniquely specifies the exact MCC Word bit pattern positioned in its time base. It has the format **X.YZ.SPID** where:

- X** is a decimal number from 00 to 36, each of which identifies a specific Basic MILES Code bit pattern as listed in Appendix A. Each Logic State 1 in Appendix A is always positioned in Bin 0 of any Time Slot of a MCC Word in which it occurs. **X is the only part of the MCC Word that is decoded by a Basic MILES set.**
- SPID** (Standard Player Identification) is a decimal number from 001 to 330, each of which identifies a specific bit pattern as listed in Appendix B. These bit patterns are used to encode desired Player Identification (PID), Ammunition Type, and **BLUEFOR or OPFOR** designation into the MCC Word. **The**

SPID is encoded by inserting a Logic State 1 into four of the eleven Time Slots in the MCC Word. Since Bin 0 of a Time Slot is reserved for the X portion of the MCC Word, only Bins 6, 8, and 10 are used for the SPID. Refer to Paragraph 3.2.1.5.1 for the method to translate any desired Player ID number, ranging from 0001 to 3300, for any specified allowed ammo type into the MCC YZ.SPID portion of the Word Designator.

- c. **Y** is a hexadecimal number from 0 to F, representing a binary bit pattern 0000 to 1111. This number, along with **Z**, is used to allow more information to be “carried” with the **SPID**. Each 0 in the bit pattern represented by the hexadecimal number indicates that the logic 1 of the **SPID** is in Bin 8 of the Time Slot. Each 1 in the bit pattern indicates the logic 1 is in Bin 6 of the Time Slot. Since there are only four (4) logic 1s in a **SPID**, each bit in **Y** represents one of those logic 1s. The most significant bit of **Y** applies to the 1st logic 1 in the **SPID** bit pattern reading from left to right. The 2nd most significant bit of **Y** applies to the 2nd logic 1 of the **SPID**, etc. For example, assume the PID of 59 (10010011000) is to be encoded. If **Y** were given the value of D (1101), this would indicate that Time Slots 0, 3, and 7 would have a logic 1 in Bin 6, and that Time Slot 6 would have a logic 1 in Bin 8.
- d. **Z** is also a hexadecimal number from 0 to F that represents a bit pattern from 0000 to 1111. **Z** is used to modify the “instruction” given by **Y**. Every logic 1 in **Z** indicates that instead of Bin 8, Bin 10 of a Time Slot is used and the corresponding **Y** logic state position is 0. A logic 0 indicates that the Bin specified in **Y** is to be used. Just like **Y**, each bit in **Z** represents one of the four logic 1s of the **SPID**, where the most significant bit of **Z** corresponds to the most significant bit of the **SPID**; the 2nd most significant bit of **Z** corresponds to the 2nd bit of the **SPID**, etc. Consider the following example as to how **Z** can modify the instruction given by **Y**:

Given a PID of 59 (10010011000)
Y is D (1101)
Z is 2 (0010)

The **SPID** indicates there will be a Logic State 1 in Time Slots 0, 3, 6, and 7. **Y** indicates that Time Slots 0, 3, and 7 would have a Logic State 1 in Bin 6, and Time Slot 6 would have a Logic State 1 in Bin 8. Given that **Z** is 2 (0010), Time Slot 6 would now have a Logic State 1 in Bin 10 instead of in Bin 8. Time Slots 0, 3, and 7, would remain unchanged and still use Bin 6.

A complete list of the valid MCC PID/Ammo type partition is contained in Appendix C, Table 1, for each X entry in Appendix A. Appendix C, Table 2 specifies Bin positions corresponding to the YZ portion of the Word Designator.

3.2.1.3.1.

Example MCC Word Designator Translation to Its Bit Pattern

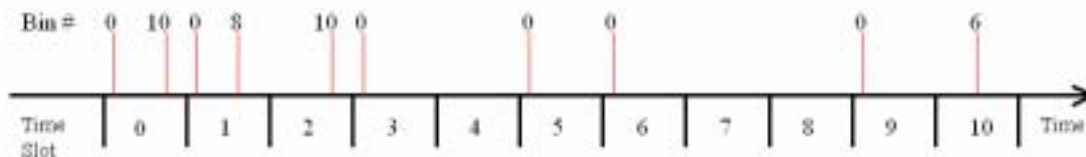


Figure 2 MCC Word 12.1A.211 Bit Pattern

For example, the bit pattern for Word, 12.1A.211, illustrated in Figure 2, translates as follows:

- a. The first two digits, 12, is **X**, the Basic Miles Code bit pattern. Appendix A indicates the bit pattern for 12 to be 11010110010. Each Logic State 1 is positioned in Bin 0 of the Time Slot corresponding to its column position in Appendix A. A Logic State 1 positioned in Bin 0 of Word Time Slot 0, etc. Figure 3 illustrates **X** of the MCC Word.



Figure 3 X of MCC Word

- b. The last three digits, 211, represent the **SPID**. The bit pattern found in Appendix B for entry 211 is 11100000001. Each Logic State 1 of the **SPID** is positioned in the Time Slot (labeled 0, 1, ... 10) corresponding to the column that the bit occurs (labeled D0, D1, ...D10). Each bit is precisely positioned in either Bin 6, Bin 8, or Bin 10 of its Time Slot according to the instruction contained in the **Y** and **Z** hexadecimal code digits of the Word Designator. In this example, the bit pattern specified by 211 has a Logic State 1 in Time Slots 0 (D0), 1(D1), 2(D2), and 10 (D10).
- c. The **Y** hexadecimal digit, 1, converted to binary in the order most significant bit to least is 0001. A 1 signifies that its corresponding Logic State 1 is positioned in Bin 6 of a Time Slot. A 0 signifies Bin 8. In this example, the bit in Time Slot 0 is positioned in Bin 8, the bit in Time Slot 1 is in Bin 8, the bit in Time Slot 2 is in Bin 8, and the bit in Time Slot 10 is in Bin 6. Figure 4 illustrates the **SPID** bit pattern in the Bins as indicated by **Y**.



Figure 4 SPID Bit Pattern in Bins Designated by Y

- d. The **Z** hexadecimal digit, A, converted to binary is 1010. A 1 signifies the corresponding bit is positioned in a Bin 10 of its Time Slot superceding the instruction of the **Y** hexadecimal digit. A 0 signifies the corresponding bit remains in the Bin in which it was positioned by **Y**. In this example, the bit in Time Slot 0 shifts to Bin 10 and the bit in Time Slot 1 remains in Bin 8, the bit in Time Slot 2 shifts to Bin 10, and bit Time Slot 10 remains in Bin 6. The **SPID** bit pattern in the Bins designated by **Z** is shown in Figure 5. The result is the bit pattern for Word, 12.1A.211, properly structured on its time base shown in Figure 2.

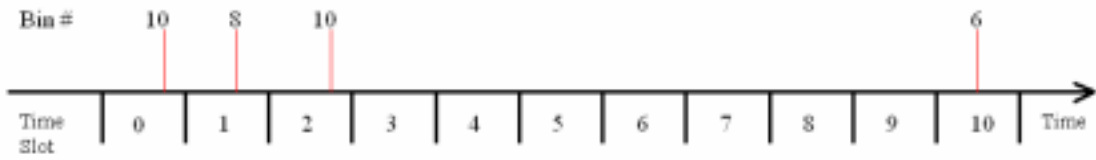


Figure 5 SPID Bit Pattern in Bins Designated by Y and Z

Refer to Appendix C, Table 2 for a list of all valid YZ.SPID Designator SPID bit pattern Bin locations.